

A survey on frequency of insect bite hypersensitivity (IBH) in horses of Khuzestan province, Iran

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Abstract

Insect bite hypersensitivity is a recurrent and chronic dermatitis in horses, that is mainly caused by an allergic reaction to the bites of Culicoids species, and therefore in areas where these insects can grow, the risk of getting the disease also increases. The conditions in Khuzestan province (located in southwestern of Iran) are mostly hot and humid, causing many veterinarians to encounter horses with IBH symptoms. The present study aimed to evaluate the frequency of insect bite hypersensitivity among horses in this province. The study was performed on 255 Arabian horses kept in 21 horse breeding centers located in 6 cities of this province. The horses were examined for the presence or absence and location of skin lesions, along with the individual animal information, which was recorded in relevant forms. The prepared serum samples (32 healthy horses and 61 affected horses) were evaluated for total IgE using the ELISA test according to the instructions of the kit manufacturer. The results showed that 144 (56.5%) out of totally 255 horses had clinical signs of IBH. Statistical evaluations also revealed that among the hosting factors (including age, gender, bloodline, coat color, body condition score, and type of use), and management and environmental factors (including stud size, methods of control of insect, distance from the horse breeding centers to the water source, times of fecal collection in the horse breeding centers and the geographical location of the horse breeding centers), only stud size had a significant effect on the prevalence of IBH. In other cases, there was no significant relationship between the prevalence of the disease and the evaluated factor. The results also showed that the amount of IgE in affected horses was higher than in healthy horses. The results of this study showed that insect bite hypersensitivity exists with a significant frequency among horses kept in the horse breeding centers in Khuzestan province.

Key words: Insect bite hypersensitivity, Elisa, Horses, Khuzestan province

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References

- Adams, A.A., Katepalli, M.P., Kohler, K., Reedy, S.E., Stilz, J., Vick, M.M., Fitzgerald, B.P., Lawrence, L.M & Horohov, D.W. (2009). Effect of body condition, body weight and adiposity on inflammatory cytokine responses in old horses. *Veterinary Immunology and Immunopathology*, 127(3-4): 286-294.
- Anderson, G.S., Belton, P & Belton, E. (1993). A population study of *Culicoides obsoletus* Meigen (Diptera: Ceratopogonidae), and other *Culicoides* species in the Fraser Valley of British Columbia. *The Canadian Entomologist*, 125(3): 439-447
- Anderson, G.S., Belton, P & Kleider, N. (1988). The hypersensitivity of horses to *Culicoides* bites in British Columbia. *The Canadian Veterinary Journal*, 29(9): 718-723.
- Baker, K & Quinn, P. (1978). A report on clinical aspects and histopathology of sweet itch. *Equine Veterinary Journal*, 10(4), 243-248.
- Bjornsdottir, S., Sigvaldadottir, J., Brostrom, H., Langvad, B & Sigurosson, A. (2006). Summer eczema in exported Icelandic horses: influence of environmental and genetic factors. *Acta Veterinaria Scandinavica*, 48(1): 1-4.
- Brostrom, H., Larsson, Å & Troedsson, M. (1987). Allergic dermatitis (sweet itch) of Icelandic horses in Sweden: an epidemiological study. *Equine Veterinary Journal*, 19(3): 229-236.
- Canöz, M., Erdenen, F., Uzun, H., Müderrisoglu, C & Aydin, S. (2008). The relationship of inflammatory cytokines with asthma and obesity. *Clinical and Investigative Medicine*, 31(6): 373-379.
- Constable, P.D., Hinchcliff, K.W., Done, S.H & Grunberg, W. (2017). *Veterinary Medicine*, 11th ed, Elsevier, Missouri, PP: 1559-1560.
- Eriksson, S., Grandinson, K., Fikse, W., Lindberg, L., Mikko, S., Broström, H., Frey, R., Sundquist, M & Lindgren, G. (2008). Genetic analysis of insect bite hypersensitivity (summer eczema) in Icelandic horses. *Animal*, 2(3): 360-365
- Fadok, V. A & Greiner, E. (1990). Equine insect hypersensitivity: skin test and biopsy results correlated with clinical data. *Equine Veterinary Journal*, 22(4): 236-240.
- Frey, R., Bergvall, K & Egenvall, A. (2008). Allergen-specific IgE in Icelandic horses with insect bite hypersensitivity and healthy controls, assessed by FcεR1α-based serology. *Veterinary Immunology and Immunopathology*, 126(1-2): 102-109.
- Greiner, E.C., Fadok, V.A & Rabin E.B. (1990). Equine *Culicoides* hypersensitivity in Florida: biting midges aspirated from horses. *Medical and veterinary entomology*, 4(4): 375-381.
- Halldórsdóttir, S & Larsen, H. (1991). An epidemiological study of summer eczema in Icelandic horses in Norway. *Equine Veterinary Journal*, 23(4): 296-299.
- Hellberg, W., Wilson, A., Mellor, P., Doherr, M., Torsteinsdóttir, S., Zurbriggen, A., Jungi, T & Marti, E. (2006). Equine insect bite hypersensitivity: immunoblot analysis of IgE and IgG subclass responses to *Culicoides nubeculosus* salivary gland extract. *Veterinary Immunology and Immunopathology*, 113(1-2): 99-112.
- Hersoug, L.G & Linneberg, A. (2007). The link between the epidemics of obesity and allergic diseases: does obesity induce decreased immune tolerance? *Allergy*, 62(10): 1205-1213.
- Knottenbelt, D.C. (2009). *Pascoes: Principles and Practice of Equine Dermatology*, 2th ed, Saunders. Elsevier, United Kingdom, PP: 284-286.
- Kleider, N & Lees, M. (1984). *Culicoides* hypersensitivity in the horse: 15 cases in southwestern British Columbia. *The Canadian Veterinary Journal*, 25(1): 26-32.
- Lange, S., Hamann, H., Deegen, E., Ohnesorge, B & Distl, O. (2005). Investigation of the prevalence of summer eczema in Icelandic horses in northern Germany. *Berliner und Munchener Tierarztliche Wochenschrift*, 118(11-12): 481-489.
- Langner, K.F., Darpel, K.E., Drolet, B.S., Fischer, A., Hampel, S., Heselhaus, J.E., Mellor, P.S., Mertens, P.P & Leibold, W. (2008). Comparison of cellular and humoral immunoassays for the assessment of summer eczema in horses. *Veterinary Immunology and Immunopathology*, 122(1-2): 126-137.
- Lillie, T.H., Marquardt, W.C & Jones, R.H. (1981). THE Flight range of *Culicoides variipennis* (Diptera: Ceratopogonidae). *The Canadian Entomologist*, 113(5): 419-426.

- Littlewood, J.D. (1998). Incidence of recurrent seasonal pruritus ('sweet itch') in British and German shire horses. *The Veterinary Record*, 142(3): 66-67.
- Littlewood, J.D & Heidmann, P. (2006). The skin. In: Higgins, DJ and Snyder, JR. (Eds). *The Equine Manual*, 2th ed. Elsevier, China, PP: 369-372.
- Marsella, R. (2013). Equine allergy therapy: update on the treatment of environmental, insect bite hypersensitivity, and food allergies. *Veterinary Clinics: Equine Practice*, 29(3): 551-557.
- Marsella, R. (2015). Ventral dermatitis. In: Sprayberry, KA and Robinson, NE. (Eds). *Robinsons Current Therapy in Equine medicine*. 7th ed. Elsevier, United states, P: 549.
- Marti, E., Horohov, D.W., Antzak, D.F., Lazary, S & Lunn, D.P. (2003). Advances in equine immunology: havemeyer workshop reports from Santa Fe, New Mexico, and Hortobagy, Hungary. *Veterinary Immunology and Immunopathology*, 91(3-4): 233-243.
- Marti, E., Urwyler, A., Neuenschwander, M., Eicher, R., Meier, D., De Weck, A.L., Gerber, H., Lazary, S & Dahinden, CA. (1999). Sulfidoleukotriene generation from peripheral blood leukocytes of horses affected with insect bite dermal hypersensitivity. *Veterinary Immunology and Immunopathology*, 71(3-4): 307-320.
- McCaig, J. (1973). A survey to establish the incidence of sweet itch in ponies in the United Kingdom. *The Veterinary Record*, 93(16): 444-446.
- McCaig, J. (1975). Recent thoughts on sweet itch. *Veterinary Annual*, 15: 204-206.
- Meiswinkel, R., Baylis, M & Labuschagne, K. (2000). Stabling and the protection of horses from *Culicoides Bolitinos* (Diptera: Ceratopogonidae), a recently identified vector of African horse sickness. *Bulletin of Entomological Research*, 90(6): 509-15.
- Mellor, P., Boorman, J & Baylis, M. (2000). *Culicoides* biting midges: their role as arbovirus vectors. *Annual Review of Entomology*. 45(1): 307-340.
- Meulenbroeks, C., Van der Meide, N.M., Zaiss, D.M., Van Oldruitenborgh-Oosterbaan, M.S., Van der Lugt, J.J., Smak, J., Rutten, V.P & Willemse, T. (2013). Seasonal differences in cytokine expression in the skin of Shetland ponies suffering from insect bite hypersensitivity. *Veterinary Immunology and Immunopathology*, 151(1-2): 147-156.
- Morris, D.O & Lindborg, S. (2003). Determination of 'irritant' threshold concentrations for intradermal testing with allergenic insect extracts in normal horses. *Veterinary Dermatology*, 14(1): 31-36.
- Novotny, E.N., White, S.J., Wilson, A.D., Stefánsdóttir, S.B., Tijhaar, E., Jonsdóttir, S., Frey, R., Reiche, D., Rose, H & Rhyner, C. (2021). Component-resolved microarray analysis of IgE sensitization profiles to *Culicoides* recombinant allergens in horses with insect bite hypersensitivity. *Allergy*, 76(4): 1147-1157.
- Peeters, L., Janssens, S., Coussé, A & Buys, N. (2014). Insect bite hypersensitivity in Belgian warmblood horses: prevalence and risk factors. *Vlaams Diergeneeskundig Tijdschrift*, 83(5): 240-249.
- Pilsworth, R & Knottenbelt, D. (2004). Equine insect hypersensitivity. *Equine Veterinary Education*, 16(6): 324-325.
- Rashmir-Raven, A. M. (2017). Disorders of the skin. In: Reed, S. M, Bayly, W. M and Sellon, D. C(Eds). *Equine Internal Medicine*. 4th ed, Elsevier, Missouri, PP: 1190-1191.
- Reiher, R & Björnsdóttir, S. (2004). The prevalence of summer eczema in Icelandic horses born in Germany. In: *International Symposium on Diseases of the Icelandic Horse*, Veterinary Association Icelandic (Ed.). International Veterinary Information Service, Ithaca NY, USA. P.
- Riek, R. (1953), Studies on allergic dermatitis (Queensland itch) of the horse: I-description, distribution, symptoms and pathology. *Australian Veterinary Journal*, 29(7): 177-184.
- Schurink, A (2012). Insect bite hypersensitivity in horses: genetic and epidemiological analysis. PhD thesis, Wageningen University, the Netherlands, 978-94-6173-356-6.
- Schurink, A., Podesta, S.C., Ducro, B.J., Van Arendonk, J.A & Frankena, K. (2013). Risk factors for insect bite hypersensitivity in Friesian horses and Shetland ponies in The Netherlands. *The Veterinary Journal*, 195(3): 382-384.
- Sloet van Oldruitenborgh-Oosterbaan, M.M., Van Poppel, M., De Raat, I.J., Van Den Boom, R & Savelkoul, HF. (2009). Intradermal testing of horses with and without insect bite hypersensitivity in the Netherlands using an extract of native *Culicoides* species. *Veterinary Dermatology*, 20(5-6): 607-614.

- Torsteinsdottir, S., Scheidegger, S., Baselgia, S., Jonsdottir, S., Svansson, V., Björnsdottir, S & Marti, E. (2018). A prospective study on insect bite hypersensitivity in horses exported from Iceland into Switzerland. *Acta Veterinaria Scandinavica*, 60(1): 1-10.
- Van Grevenhof, E., Ducro, B., Heuven, H & Bijma, P. (2007). Identification of environmental factors affecting the prevalence of insect bite hypersensitivity in Shetland ponies and Friesian horses in the Netherlands. *Equine Veterinary Journal*, 39(1): 69-73.
- Vick, M., Adams, A., Murphy, B., Sessions, D., Horohov, D., Cook, R., Shelton, B & Fitzgerald, B. (2007). Relationships among inflammatory cytokines, obesity, and insulin sensitivity in the horse. *Journal of Animal Science*, 85(5): 1144-1155.
- Wagner, B., Childs, B.A & Erb, H.N. (2008). A histamine release assay to identify sensitization to *Culicoides* allergens in horses with skin hypersensitivity. *Veterinary Immunology and Immunopathology*, 126(3-4): 302-308.
- Yeruham, I., Braverman, Y & Orgad, U. (1993). Field observations in Israel on hypersensitivity in cattle, sheep and donkeys caused by *Culicoides*. *Australian Veterinary Journal*, 70(9): 348-352.